PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:		)	
		)	
Vikram Magoon		)	Examiner: Tod T. Van Roy
		)	
Serial No.:	10/645,143	)	Group Art Unit: 2828
		)	
Filed:	August 20, 2003	)	Docket: P16184
		)	
For:	LASER DRIVER CIRCUIT	)	

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Mail Stop Appeal Brief
Commissioner for Patents
P.O.Box 1450
Alexandria, VA 22313-1450

Sir:

This Brief is submitted in support of the Appeal in the above-identified application. Appellant is filing this Brief filed outside of the two-month period of reply. Authorization to charge a credit card has been provided upon electronic filing of this Brief to provide for an extension of time and provide for the fee set forth in § 37 C.F.R. § 41.20(b)(2). As provided below, please charge Deposit Account No. 50-2121 for any required fee, or for any deficiency in the enclosed fee.

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1. REAL PARTY IN INTEREST

The real party in interest of the above-captioned patent application is the assignee, INTEL CORPORATION.

2. RELATED APPEALS AND INTERFERENCES

No prior or pending appeals, interferences or judicial proceedings are known to appellant, appellant's legal representative, or assignee, which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

3. STATUS OF THE CLAIMS

Claims 1-17 are rejected. Claim 18 was added prior to the Final Office Action but claim 18 has not been explicitly rejected nor explicitly allowed. Therefore, claims 1-18 are on appeal.

Appellant notes that claims 12-17 were *provisionally* rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-6 of copending Application No. 10/442,829 in view of Kobayashi (U.S. Patent No. 6,373,346) and Larson (U.S. Patent No. 5,767,704) in the Office Actions dated June 24, 2005 and November 25, 2005. Said provisional obviousness-type double patenting rejection was stayed pending the outcome of Application No. 10/442,829 in the Office Actions dated June 7, 2006 and November 12, 2006. Appellant further notes that Application No. 10/442,829 issued as U.S. Patent No. 7,142,574 on November 28, 2006. Accordingly, Appellant will address any judicially created doctrine of obviousness-type double patenting rejections and may provide a terminal disclaimer upon the indication of allowance of the pending claims.

4. STATUS OF AMENDMENTS

No amendments have been filed subsequent to final rejection.

5. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a laser driver circuit, for example, as shown in Figs. 4 and 5. The laser driver circuit includes an input stage, such as input stage 402, to receive an input signal, a limiting amplifier, such as limiting amplifier 404, to generate a pulse data output signal in response to the input signal, the pulse data output signal comprising a duty cycle and an output stage, such as output stage 310, to modulate an output current signal based on the pulse data output signal (p.11, ll. 10-12; p.11, ll. 12-14; p.7, ll. 19-21; and p.11, ll. 2-3)[1]. The laser driver circuit further includes a duty cycle control circuit, such as duty cycle control circuit 306, including an average power approximation circuit, such as average power approximation circuit 422, to control the duty cycle of the pulse data output signal based, at least in part, on an approximation of an average power of the pulse data output signal (p.10, ll. 20-21; p.13, l. 22 – p.14, l. 4; and p.7, ll. 21-22).

Independent claim 7 is directed to a method. The method includes generating a pulse data output signal in response to an input signal, the pulse data output signal comprising a duty cycle (p. 7, ll. 19-21). The method further includes controlling the duty cycle of the pulse data output signal based, at least in part, upon an approximation of the average power of the pulse data output signal, wherein the approximation of the average power is generated using an average power approximation circuit (p. 7, ll. 21-22; p. 13, l. 22 – p. 14, l. 4).

Independent claim 12 is directed to a system, for example, as shown in Fig. 3. The system includes a serializer to provide a serial data signal in response to a parallel data signal, a laser device, such as laser device 208, adapted to be coupled to an optical transmission medium to transmit an optical signal, such as optical signal 210, in the optical transmission medium in response to a current signal, such as current signal 216, and a laser driver circuit, such as laser driver circuit 222 (p.8, ll. 22-23, and p.10, ll. 7-9, 12-15). The laser driver circuit includes an input stage, such as input stage 402, to receive an input signal, a limiting amplifier, such as limiting amplifier 404, to generate a pulse data output signal in response to the input signal, the

[1] Page and line numbers refer to the specification as filed.

pulse data output signal comprising a duty cycle and an output stage, such as output stage 310, to modulate an output current signal based on the pulse data output signal (p.11, ll. 10-12; p.11, ll. 12-14; p.7, ll. 19-21; and p.11, ll. 2-3). The laser driver circuit further includes a duty cycle adjustment circuit, such as duty cycle control circuit 306, including an average power approximation circuit, such as average power approximation circuit 422, to adjust the duty cycle of the pulse data output signal based, at least in part, on an approximation of an average power of the pulse data output signal (p.10, ll. 20-21; p.13, l. 22 – p.14, l. 4; and p.7, ll. 21-22).

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1-3 and 7-8 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,373,346 to Kobayashi (hereinafter referred to as "Kobayashi") in view of U.S. Patent No. 6,130,562 to Bosch, et al. (hereinafter referred to as "Bosch") and further in view of U.S. Patent No. 6,975,813 to Inoue, et al. (hereinafter referred to as "Inoue").

Whether claims 4-6 and 9-11 are unpatentable under 35 U.S.C. §103(a) over Kobayashi in view of Bosch, in view of Inoue and further in view of U.S. Patent No. 6,711,189 to Gilliland, et al. (hereinafter referred to as "Gilliland").

Whether claim 12 is unpatentable under 35 U.S.C. §103(a) over Kobayashi in view of Bosch in view of Inoue and further in view of U.S. Patent No. 6,654,565 to Kenny (hereinafter referred to as "Kenny").

Whether claims 13-17 are unpatentable under 35 U.S.C. §103(a) over Kobayashi in view of Bosch in view of Inoue in view of Kenny and further in view of U.S. Patent No. 6,822,987 to Diaz et al. (hereinafter referred to as "Diaz").

7. ARGUMENT

A. Introduction

The Final Office Action dated November 13, 2006, ("Office Action") rejected claims 1-17 of the pending claims as being obvious under §103(a). In making these rejections, the Office primarily relies on U.S. Patent No. 6,373,346 to Kobayashi, Bosch and Inoue. Appellant submits that the Office Action has misapplied the teachings of at least Kobayashi, Bosch and Inoue and submits that the combination of these reference does not disclose or suggest controlling the duty cycle of a pulse data output signal based on, at least in part, an approximation of an average power of the pulse data output signal. Before addressing each of the rejections in detail, this Brief summarizes the disclosures in the Kobayashi, Bosch and Inoue references.

(i) U.S. Patent No. 6,373,346 to Kobayashi

Kobayashi discloses an apparatus and method for implementing laser driver amplifiers that shape or equalize the waveform of a high data rate output signal (see Kobayashi, col. 1, lines 16-19). FIG. 6 of Kobayashi is reproduced below:

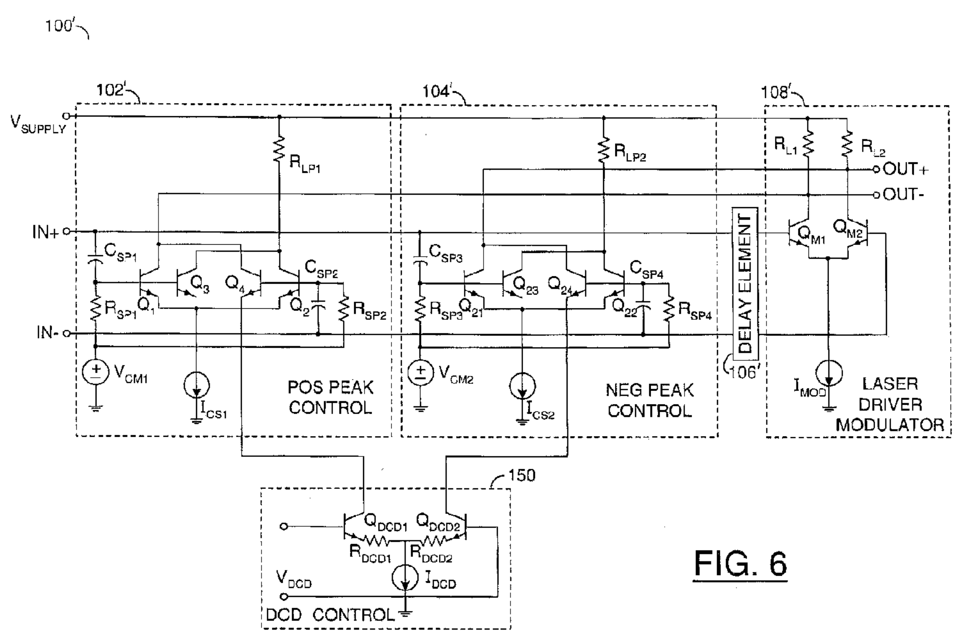


FIG. 6

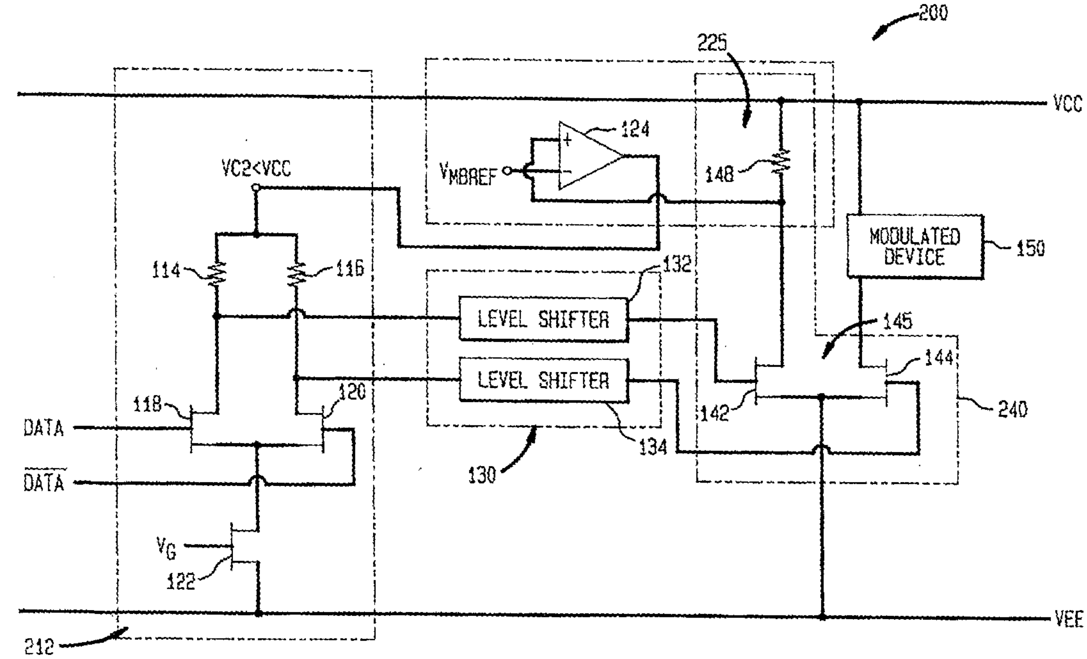
The laser driver predistortion architecture, shown in FIG. 6 of Kobayashi, compensates for distortion produced in laser driver amplifiers when converting electrical energy to optical energy at data rates on the order of 10 Gigabits per second (see Kobayashi, col. 1, lines 40-50). The predistortion may be implemented with a pre-emphasis or peaking function that reduces the rise and fall times of the original data waveform (see Kobayashi, col. 1, lines 51-54). De-emphasis may also be desirable in situations where excessive peaking is present (see Kobayashi, col. 3, lines 5-7). A tunable finite current source I_{CS1} controls the weight of the pre-emphasis signal produced by the positive peak control circuit 102' (see Kobayashi, col. 5, lines 41-46). Likewise, a tunable finite current source I_{CS2} controls the weight of the de-emphasis signal produced by the negative peak control circuit 104' (see Kobayashi, col. 5, lines 49-54).

The pre-emphasis 102' and de-emphasis 104' circuits may introduce duty cycle distortion because of their unbalanced DC nature (see Kobayashi, col. 6, lines 42-52). A duty cycle distortion control circuit 150 compensates for the DC offset that may be introduced by the pre-emphasis 102' and de-emphasis 104' circuits (see Kobayashi, col. 6, lines 61-63). The current source I_{DCD} may be set or tuned to compensate for the output DC offset produced by the pre-emphasis and de-emphasis circuits 102' and 104' (see Kobayashi, col. 7, lines 4-8).

(ii) U.S. Patent No. 6,130,562 to Bosch, et al.

Bosch discloses digital driver circuits that may have increased output voltage and current amplitudes without increasing the power supply voltage (see Bosch, col. 2, lines 49-52). FIG. 3 of Bosch is reproduced below:

FIG. 3



Bosch discloses a digital driver circuit 200 for driving a modulated device 150 (see Bosch, col. 4, ll. 63-64). The circuit 200 includes three stages: an input stage 212, a level shifting stage 130 and an output stage 240 (see Bosch, col. 4, l. 66 – col. 5, l. 1). The input stage 212 quantizes the input signals DATA and DATA(bar) (see Bosch, col. 4, ll. 7-8). The level shifting stage 130 ensures that the voltage levels of the quantized signals are at the proper level for the remaining circuitry of the driver circuit (see Bosch, col. 4, ll. 21-24). The output stage 240 comprises a differential amplifier 145 that drives the modulated device 150 (see Bosch, col. 4, ll. 37-39, 49-50).

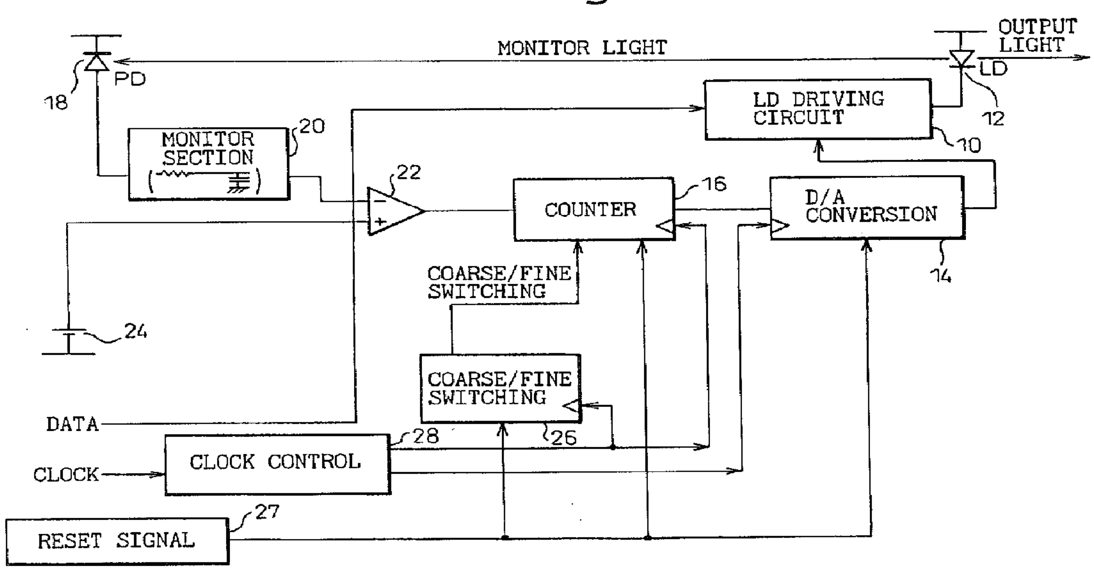
The digital driver circuit 200 further comprises an output amplitude control circuit 225 (see Bosch, col. 5, ll. 25-28). The output amplitude control circuit 225 includes an operational amplifier 124, with a reference voltage V_{MBREF} coupled to one input and load resistor 148 as a current sensing resistor coupled to its second input (see Bosch, col. 5, ll. 17-18, 23-28). The

reference voltage V_{MBREF} is user-defined and corresponds to the duty cycle of the input data signals DATA, DATA(bar) (see Bosch, col. 5, ll. 19-20, 31). The output of the output amplitude control circuit 225 is used as a control voltage V_{C2} of the input stage 212 (see Bosch, col. 5, ll. 27-28). The output amplitude control circuit 225 is used to automatically control and maintain the output voltage and current of the output stage 240 by creating and maintaining a constant voltage (equal to M_{BREF}) across load resistor 148 (see Bosch, col. 5, ll. 47-55).

(iii) U.S. Patent No. 6,975,813 to Inoue, et al.

Inoue discloses a light output control circuit for controlling the light output of a light-emitting device, such as a laser diode (see Inoue, col. 1, ll. 6-10). FIG. 4 of Inoue is reproduced below:

Fig. 4



Inoue discloses a light output control circuit for use with a laser driving circuit for continuous transmission applications (see Inoue, col. 7, ll. 40-43). A drive current, modulated with a data signal in the LD driving circuit 10, is supplied to the light-emitting device 12 (see

Inoue, col. 7, ll. 44-46). The drive current value is controlled using the counter 16 and the D/A conversion circuit 14 (see Inoue, col. 7, ll. 47-48). The monitor current, which is proportional to the light-emitting device 12 output, is I/V converted by the monitor section 20, and the result is compared with the reference value 24 to manipulate the counter 16 (see Inoue, col. 7, ll. 48-51). Since this circuit is used for continuous transmission, the monitor section 20 uses an average value detection circuit comprising a resistor and a capacitor (see Inoue, col. 7, ll. 59-61).

B. Rejection under 35 U.S.C. §103(a)

The rejections under 35 U.S.C. § 103(a) are improper because the Office Action fails to establish that the claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made. As will be detailed below, the combination of these references as suggested by the Office Action does not disclose or suggest controlling the duty cycle of a pulse data output signal based on, at least in part, an approximation of an average power of the pulse data output signal. In fact, the Office Action even explicitly acknowledges that none of the references disclose or suggest these limitations. The Office Action also fails to provide an adequate reasoning why one of ordinary skill in the art would have modified the duty cycle control circuit of Kobayashi based on the teachings of Bosch and Inoue which the Office Action acknowledges do not teach or suggest anything about controlling the duty cycle. Finally, the proposed modification suggested by the Office Action would render Kobayashi unsatisfactory for its intended purpose.

A claimed invention is unpatentable if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the pertinent art. 35 U.S.C. § 103(a) (2000); *Graham v. John Deere Co.*, 383 U.S. 1, 13-14 (1966). *Graham v. John Deere Co.* sets forth the framework for applying the obviousness standard under Section 103 as follows:

1. Determine the scope and contents of the prior art,
2. Ascertain the differences between the prior art and the claims at issue,

3. Resolve the level of ordinary skill in the art, and
4. Consider objective evidence of nonobviousness.

To reject claims in an application under Section 103, an examiner must show an unrebutted *prima facie* case of obviousness. *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998). In the absence of a proper *prima facie* case of obviousness, an applicant who complies with the other statutory requirements is entitled to a patent. *Id.* On appeal to the Board, an appellant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness. *Id.* Additionally, there must be a determination of whether there was an apparent reason to combine known elements in the fashion claimed and this analysis should be made explicit. *KSR Int'l Co. v. Teleflex Inc.*, No. 04-1350, slip op. at 14 (U.S. Apr. 30, 2007). A patent claim reciting several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *Id.* Moreover, prior art teachings are not sufficient to render a claim *prima facie* obvious if the proposed modification or combination of prior art would change a principle of operation of the prior art invention being modified. *In re Ratti*, 270 F.2d 810 (CCPA 1989). If prior art teaches away from combining known elements, discovery of a successful means of combining them may be nonobvious. *KSR*, No. 04-1350, slip op. at 12 (citing *U.S. v. Adams*, 383 U.S. 39, 51-52 (1966)).

<u>(i) Rejection under 35 U.S.C. § 103(a) over Kobayashi, Bosch and Inoue</u>

<u>*Claims 1-3 and 7-8*</u>

Claims 1-3 and 7-8 would not have been obvious over the combination of Kobayashi, Bosch and Inoue because the combination, as proposed in the Office Action, would not teach or suggest all of the limitations recited in independent claims 1 and 7. Independent claim 1 recites a laser driver circuit comprising "a duty cycle control circuit, including an average power approximation circuit, <u>to control the duty cycle of the pulse data output signal based, at least in part, on an approximation of an average power of the pulse data output signal</u>" (emphasis added). Independent method claim 7 similarly recites "controlling the duty cycle of the pulse data output

signal based, at least in part, upon an approximation of the average power of the pulse data output signal." Even if Kobayashi were modified to apply the teachings of Bosch and Inoue, as proposed in the Office Action, Appellant submits that the proposed combination would not result in a method or system that controls the duty cycle of a pulse data output signal based at least in part upon an approximation of the average power of the pulse data output signal as generally recited in independent claims 1 and 7. Moreover, as will be discussed further below, Appellant submits that the Office Action acknowledges that neither Bosch nor Inoue disclose or suggest controlling a duty cycle of a pulse data output signal.

As the Office Action correctly recognizes, "Kobayashi does not teach the duty cycle to be based on an average power of the pulse data output signal, or to include an average power approximation circuit." See Office Action, page 5, lines 3-5. In rejecting independent claims 1 and 7, the Office Action relies upon Bosch and Inoue for the elements missing from Kobayashi. Appellant respectfully submits that the Office Action mischaracterizes and misapplies the teachings of Bosch and Inoue and further submits that one of ordinary skill in the art would not understand either Bosch or Inoue to teach or suggest controlling the <u>duty cycle</u> of pulse data output signal based, at least in part, on average power of the pulse data output signal as generally recited in independent claims 1 and 7.

In particular, Appellant respectfully submits that one of ordinary skill in the art would not understand Bosch to disclose or suggest controlling the duty cycle of a pulse data output signal as generally recited in independent claims 1 and 7. Bosch is only understood to disclose a digital driver circuit 100 including three stages – an input stage 112, 212, level shifting stage 130, 230, and an output stage 140, 240. See Bosch, FIGS. 2 and 3, col. 3, lines 32-34. An output amplitude control circuit 125, 225 provides an output used as a control voltage V_{C2} of the input stage 112, 212 to automatically control and maintain the <u>output voltage and current</u> of the output stage 140, 240. *Id.* at col. 3, lines 46-50, col. 4, lines 8-11, and col. 5, lines 9-32. Bosch further teaches that the control voltage V_{C2} is used by the input stage 112, 212 to <u>control the output voltage and current</u> to provide "increased output current and voltage amplitudes in a digital

driver circuit." *Id.* at col. 2, lines 42-43. Accordingly, one of ordinary skill in the art would not understand Bosch to teach or suggest that the control voltage V_{C2} of Bosch is used by the input stage 112, 212 to control duty cycle.

Moreover, the Office Action mischaracterizes the input stage 212 in FIG. 3 of Bosch as "a duty cycle circuit". In particular, the Office Action states that "Bosch teaches a laser driving circuit with an output feedback circuit to a duty cycle input circuit (fig.3 #212) based on a power of the output (fig.3 #124, from #148 to VC2)." However, the "output feedback" mentioned in the Office Action is provided to the input stage 212, <u>not</u> a duty cycle control circuit, and what is being controlled is the output voltage, <u>not</u> a duty cycle of a pulse data output signal. Thus, Appellant respectfully submits that one of ordinary skill in the art would not understand Bosch to disclose or suggest controlling the duty cycle of a pulse data output signal based on the power of the pulse output data signal. Instead, Bosch merely teaches controlling the output voltage and current to provide "increased output current and voltage amplitudes in a digital driver circuit." *Id.* at col. 2, lines 42-43

After a careful review of Bosch, the only mention whatsoever of "duty cycle" in Bosch was found in connection with the Mark-Bar reference voltage V_{MBREF}. Specifically, one embodiment in Bosch teaches that the voltage signal V_{C2} used by the input stage 112, 212 to *control the output voltage and current* of the output stage 240 may be based on, in part, a Mark-Bar reference voltage V_{MBREF}. *Id.* at col. 5, lines 25-28. Bosch teaches that the Mark-Bar reference voltage V_{MBREF} is a DC voltage corresponding to the average duty cycle of the <u>input data signals</u>, DATA and DATA(bar). *Id.* at col. 5, lines 20-23.

It is important to note that the Mark-Bar reference voltage V_{MBREF} relates to the duty cycle of the <u>input data signals</u> whereas independent claims 1 and 7 are directed towards controlling the duty cycle of the pulsed data <u>output signal</u>. Moreover, nothing in Bosch is understood to disclose or suggest <u>controlling</u> the duty cycle, let alone controlling the duty cycle based on average power of the pulse data output signal as generally recited in independent claims 1 and 7. Bosch merely refers to average duty cycle as it relates to a Mark-Bar reference voltage

V_{MBREF} which may be used by the input stage 112, 212, to control the output voltage and current. Accordingly, Bosch is not understood to teach controlling the duty cycle of a pulse data output signal based on the power of the pulse data output signal as suggested in the Office Action and recited in independent claims 1 and 7. The fact that the Mark-Bar reference voltage V_{MBREF} corresponding to the average duty cycle of the input data signals is user definable actually teaches away from the claimed invention, which controls the duty cycle based on average power of the pulse data output signal.

Appellant also submits that asserted teachings of Inoue do not remedy the deficiencies of Bosch and that the Office Action mischaracterizes and misapplies the teachings of Inoue. In particular, the Office Action refers to the "monitor section 20" in FIG. 4 of Inoue as "an average power approximation circuit" as generally recited in independent claims 1 and 7. See page 5, lines 7-9. According to Inoue, "[a] photodiode (PD) 18 produces a monitor current proportional to the amount of light emitted by the light-emitting device (LD), and a monitor section 20 converts the monitor current value into a voltage value and holds its peak value." Inoue further states "[w]ith this operation, the light output is controlled at a constant value with respect to the reference value, using negative feedback control." See Inoue, col. 1, lines 35-49 (emphasis added).

Thus, Inoue is controlling the light output (not duty cycle) at a constant value by monitoring current proportional to the light output. Although the monitor section 20 of Inoue "uses an average value detection circuit comprising a resistor and capacitor," the average value is of the current proportional to the light output (as measured by photodiode 18). This proportional current is not a pulse data output signal. Accordingly, it is clear that Inoue *only* teaches controlling light output at a constant value by monitoring current proportional to the light output. Moreover, Appellant submits that one of ordinary skill in the art would not understand Inoue to disclose or suggest controlling the duty cycle as generally recited in independent claims 1 and 7.

In summary, as the Office Action correctly recognizes, Kobayashi does not teach or suggest controlling the duty cycle based on an average power of the pulse data output signal. See Office Action, page 5, lines 3-5. Moreover, Appellant submits that one of ordinary skill in the art would not understand either Bosch or Inoue to disclose or suggest controlling the duty cycle as generally recited in independent claims 1 and 7. Instead, Bosch is only understood to teach or suggest controlling the *output voltage and current* (not duty cycle) to provide "increased output current and voltage amplitudes in a digital driver circuit." See Bosch, col. 2, lines 42-43. Additionally, Inoue is only understood to disclose or suggest controlling the *light output* (not duty cycle) at a constant value by monitoring current proportional to the light output. See Inoue, col. 1, lines 35-49. Therefore, Appellant respectfully submits that neither Bosch nor Inoue disclose or suggest the acknowledged deficiencies of Kobayashi, namely, controlling the duty cycle of the pulse data output signal base on, at least in part, an approximation of an average power of the pulse data output signal, as generally recited in independent claims 1 and 7.

At best, a combination of Kobayashi, Bosch and Inoue might result in the output voltage and current of the laser driver of Kobayashi being controlled by providing feedback to an input stage of Kobayashi (i.e., control circuits 102, 104). However, neither Bosch nor Inoue disclose or suggest controlling the duty cycle, let alone suggest the desirability of modifying the duty cycle compensation control circuit 150 of Kobayashi to control the duty cycle of the pulse data output signal based on, at least in part, an approximation of an average power of the pulse data output signal, as generally recited in independent claims 1 and 7.

Appellant would also like to address the remarks made in the Response to Arguments section of the Office Action. In particular, the Office Action states that "Bosch is combined with Kobayashi not for teaching duty cycle control, but rather to teach feedback from an output based in part on the output power." See page 3, lines 3-5 (emphasis added). The Office Action further states that "Inoue is next combined with Kobayashi and Bosch. This reference is not relied upon to teach duty cycle control, but to each the benefits of using averaged values when

using feedback in driving a circuit." See page 3, lines 11-14 (emphasis added). Finally, the Office Action states "In summary, the examiner acknowledges that Kobayashi, Bosch, and Inoue do not individually teach "a duty cycle control circuit, including an average power approximation circuit, to control the duty cycle of the pulse data output signal based, at least in part, on an approximation of an average power of the pulse data output signal. (emphasis original)". See page 3, lines 11-14.

To the extent that the Office Action relies on Bosch and Inoue as teaching the benefits of using averaged values when using feedback in driving a circuit as suggested above, Appellant submits that this is insufficient to establish that it would be obvious to control the *duty cycle* of a pulse data output signal based on an approximation of an average power of the pulse data output signal as generally recited in independent claims 1 and 7. As previously noted, independent claims 1 and 7 *do not* simply claim using averaged values when using feedback in driving a circuit in the abstract, but rather using an approximation of an average power of the pulse data output signal to control the duty cycle of the pulse data output signal. As discussed above, one of ordinary skill in the art would not understand either Bosch or Inoue to actually disclose or suggest controlling the duty cycle. Moreover, neither Bosch nor Inoue (either taken alone or in combination) disclose or suggest the desirability of modifying the duty cycle compensation control circuit 150 of Kobayashi as suggested in the Office Action to control the duty cycle of the pulse data output signal base on, at least in part, an approximation of an average power of the pulse data output signal, as generally recited in independent claims 1 and 7. Accordingly, Appellant respectfully submits that combination of Kobayashi, Bosch, and Inoue fails to establish a *prima facie* case of obviousness with respect to independent claims 1 and 7 and the claims dependent therefrom.

Furthermore, Appellant submits that combining Inoue with Kobayashi is improper because the proposed modification would render Kobayashi unsatisfactory for its intended purpose. *See In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). The effect of the

pre-emphasis circuit 102 of Kobayashi is to increases the high frequency components of the input signal as evidenced by the overshoot in FIG. 4a in order to compensate for the nonlinearities inherent in laser devices. See also Kobayashi, column 1, lines 36-50. As is well known, however, averaging a signal effectively creates a low pass filter. Thus, adding the averaging circuit of Inoue to the circuit disclosed in Kobayashi would filter-out the high frequencies added by the pre-emphasis circuit 102. As a result, Kobayashi would no longer compensate for the nonlinearities inherent in laser devices and would thereby be unsatisfactory for its intended purpose.

In summary, Appellant submits that the combination of Kobayashi, Bosch and Inoue as suggested in the Office Action does not disclose or suggest controlling the <u>duty cycle</u> based on an approximate average power of the pulse data output signal. As acknowledged in the Office Action, Kobayashi does not disclose this limitation. See Office Action, page 5, lines 3-6. Bosch teaches <u>controlling the output voltage and current</u> based on the power of the pulse data output. Bosch at col. 2, lines 42-43. Inoue teaches <u>controlling light output</u> at a constant value by monitoring current proportional to the light output. See Inoue, col. 1, lines 35-49. In fact, the Office Action even explicitly acknowledges that none of the references disclose or suggest these limitations. See Office Action, page 3, lines 11-14.

The Office Action also fails to provide adequate reasoning why one of ordinary skill in the art would have modified the duty cycle control circuit of Kobayashi based on the teachings of Bosch and Inoue which do not teach or suggest anything about controlling the duty cycle.

Finally, the proposed modification suggested by the Office Action would render Kobayashi unsatisfactory for its intended purpose since adding the averaging circuit of Inoue to the circuit disclosed in Kobayashi would filter-out the high frequencies added by the pre-emphasis circuit 102 and as a result, Kobayashi would no longer compensate for the nonlinearities inherent in laser devices thereby rendering Kobayashi unsatisfactory for its intended purpose.

Accordingly, Appellant respectfully submits that the rejection of claims 1-3 and 7-8 in view of Kobayashi, Bosch and Inoue is improper and requests that the rejection of claims 1-3 and 7-8 under 35 U.S.C. § 103(a) be reversed.

ii. Rejection under 35 U.S.C. §103(a) over Kobayashi, Bosch and Inoue and further in view of Gilliland

Claims 4-6, and 9-11

Claims 4-6 and 9-11 would not have been obvious over the combination of Gilliland in view of Kobayashi, Bosch and Inoue because the combination, as suggested in the Office Action, would not teach or suggest all of the limitations. Claims 4-6 and 9-11 depend, either directly or indirectly, from independent claims 1 and 7, respectively. The rejection of claims 4-6 and 9-11 relies upon the combination of Kobayashi, Bosch and Inoue discussed above for all of the limitations recited in independent claims 1 and 7 and asserts that Gilliland further teaches a laser power control circuit in which a potentiometer is used to control an output voltage. Because the rejection of claims 4-6 and 9-11 is based on the same combination of Kobayashi, Bosch and Inoue used to reject independent claims 1 and 7, Appellant submits that one of ordinary skill in the art would not understand the combination of Kobayashi, Bosch and Inoue to teach or suggest controlling the duty cycle based on an approximate average power of the pulse data output signal as generally recited in independent claims 1 and 7 for the same reasons discussed above. Appellant further submits that Gilliland fails to address the deficiencies of Kobayashi, Bosch and Inoue.

After a careful review of Gilliland, Appellant was unable to find any reference whatsoever to “duty cycle” in Gilliland, let alone controlling the duty cycle of a pulse signal based on an approximation of average power of the pulse signal as recited in independent claims 1 and 7. In fact, Gilliland has not even been asserted to teach controlling the duty cycle. Thus, even if the potentiometer disclosed in Gilliland could be combined with Kobayashi, Bosch and

Inoue in the manner proposed in the Office Action, the resulting combination would not teach or suggest controlling the duty cycle based on an approximate average power of the pulse data output signal as generally recited in independent claims 1 and 7.

Therefore, because claims 4-6 and 9-11 depend, either directly or indirectly, from independent claims 1 and 7, respectively, Appellant submits that claims 4-6 and 9-11 would not have been obvious over the combination of Gilliland in view of Kobayashi, Bosch and Inoue and requests that the rejection of claims 4-6 and 9-11 under 35 U.S.C. § 103(a) be reversed.

iii. Rejection under 35 U.S.C. §103(a) over Kobayashi, Bosch, and Inoue and further in view of Kenny

Claim 12

Claim 12 would not have been obvious over the combination of Kenny in view of Kobayashi, Bosch and Inoue because the combination, as suggested in the Office Action, would not teach or suggest all of the limitations recited in independent claim 12. Independent claim 12 includes limitations similar to the laser driver circuit of claim 1, namely, a laser driver circuit comprising "a duty cycle adjustment circuit, including an average power approximation circuit, to adjust the duty cycle of the pulse data output signal based, at least in part, on an approximation of an average power of the pulse data output signal" (emphasis added). Independent claim 12 further requires "a serializer to provide a serial data signal in response to a parallel data signal".

The rejection of independent claim 12 relies upon the combination of Kobayashi, Bosch and Inoue discussed above for all of the limitations recited in independent claims 1 and 7 and asserts that Kenny further teaches a "a communication system utilizing a serializer." Because the rejection of independent claim 12 is based on the same combination of Kobayashi, Bosch and Inoue used to reject independent claims 1 and 7, Appellant submits that one of ordinary skill in the art would not understand the combination of Kobayashi, Bosch and Inoue to teach or suggest

controlling the duty cycle based on an approximate average power of the pulse data output signal as generally recited in independent claims 1 and 7 for the same reasons discussed above. Appellant further submits that Kenny fails to address the deficiencies of Kobayashi, Bosch and Inoue.

Again, after a careful review of Kenny, Appellant was unable to find any reference whatsoever to "duty cycle" in Kenny, let alone controlling the duty cycle of a pulse signal based on an approximation of average power of the pulse signal as recited in independent claim 12. In fact, Kenny has not even been asserted to teach controlling the duty cycle. Thus, even if the communication system disclosed in Kenny could be combined with Kobayashi, Bosch and Inoue in the manner proposed in the Office Action, the resulting combination would not teach or suggest controlling the duty cycle based on an approximate average power of the pulse data output signal as generally recited in independent claim 12.

Therefore, Appellant submits that independent claim 12 would not have been obvious over the combination of Kenny in view of Kobayashi, Bosch and Inoue and requests that the rejection of independent claim 12 under 35 U.S.C. § 103(a) be reversed.

iv. Rejection under 35 U.S.C. §103(a) over Kobayashi, Bosch, Inoue, and Kenny and further in view of Diaz

Claims 13-17

Claims 13-17 would not have been obvious over the combination of Diaz in view of Kobayashi, Bosch, Inoue, and Kenny because the combination, as suggested in the Office Action, would not teach or suggest all of the limitations recited in claims 13-17. Claims 13-17 depend, either directly or indirectly, from independent claim 12. The rejection of claims 13-17 relies upon the combination of Kobayashi, Bosch, Inoue, and Kenny discussed above for all of the limitations recited in independent claim 12 and asserts that Diaz further teaches a high-speed laser array which uses a SONET framer. Because this rejection of claims 13-17 is based on the

same combination of Kobayashi, Bosch, Inoue, and Kenny used to reject independent claim 12, Appellant submits that one of ordinary skill in the art would not understand the combination of Kobayashi, Bosch and Inoue to teach or suggest controlling the duty cycle based on an approximate average power of the pulse data output signal as generally recited in independent claim 12 for the same reasons discussed above. Appellant further submits that Diaz fails to address the deficiencies of Kobayashi, Bosch, Inoue and Kenny.

Appellant submits that Diaz does not disclose or suggest *anything* regarding controlling the duty cycle and Diaz has not even been asserted to provide such a teaching. Thus, even if the SONET framer disclosed in Diaz could be combined with Kobayashi, Bosch, Inoue and Kenny in the manner proposed in the Office Action, the resulting combination would not teach or suggest controlling the duty cycle based on an approximate average power of the pulse data output signal as generally recited in independent claims 12.

Therefore, Appellant submits that claims 13-17 would not have been obvious over the combination of Kenny in view of Kobayashi, Bosch and Inoue and requests that the rejection of claims 13-17 under 35 U.S.C. § 103(a) be reversed.

8. SUMMARY

The Examiner erred in rejecting claims 1-17. Appellant notes that claim 18 was added prior to the Final Office Action, but claim 18 has not been explicitly rejected nor explicitly allowed. Therefore, claims 1-18 are on appeal. Claims 1-18 include three independent claims, namely, claims 1, 7 and 12. Independent claims 1, 7 and 12 generally recite controlling the duty cycle of a pulse data output single based on, at least in part, an approximation of an average power of the pulse data output signal.

The combination of Kobayashi, Bosch and Inoue as suggested in the Office Action does not disclose or suggest controlling the duty cycle based on, at least in part, an approximation of the average power of the pulse data output signal. As acknowledged in the Office Action, Kobayashi does not disclose this limitation. See Office Action, page 5, lines 3-6. Bosch teaches controlling the output voltage and current based on the power of the pulse data output. Bosch at col. 2, lines 42-43. Inoue teaches controlling light output at a constant value by monitoring current proportional to the light output. See Inoue, col. 1, lines 35-49. Instead, the Office Action asserts that it would be obvious to control the duty cycle based on various teachings of Bosch and Inoue, none of which have anything to do with controlling the duty cycle and which specifically teach controlling other parameters. In fact, the Office Action even explicitly acknowledges that none of the references disclose or suggest these limitations. See Office Action, page 3, lines 11-14.

The Office Action also fails to provide adequate reasoning why one of ordinary skill in the art would have modified the duty cycle control circuit of Kobayashi based on the teachings of Bosch and Inoue which do not teach or suggest anything about controlling the duty cycle.

Finally, the proposed modification suggested by the Office Action would render Kobayashi unsatisfactory for its intended purpose since adding the averaging circuit of Inoue to the circuit disclosed in Kobayashi would filter-out the high frequencies added by the pre-emphasis circuit 102 and as a result, Kobayashi would no longer compensate for the

nonlinearities inherent in laser devices thereby rendering Kobayashi unsatisfactory for its intended purpose.

The remaining references cited do not disclose or suggest the limitations missing from Kobayashi, Bosch and Inoue, nor have they even been asserted to provide such a teaching.

Claims 2-6, 8-11, and 13-18 depend, either directly or indirectly, from independent claims 1, 7 and 12. Therefore, Appellant submits that claims 2-6, 8-11, and 13-18 are also allowable by virtue of their dependency from independent claims 1, 7 and 12 in addition to their own patentable limitations.

Respectfully submitted,

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APPENDIX I - CLAIMS

The Claims on Appeal

1. A laser driver circuit comprising:

an input stage to receive an input signal;

a limiting amplifier to generate a pulse data output signal in response to the input signal, the pulse data output signal comprising a duty cycle;

an output stage to modulate an output current signal based upon the pulse data output signal; and

a duty cycle control circuit, including an average power approximation circuit, to control the duty cycle of the pulse data output signal based, at least in part, on an approximation of an average power of the pulse data output signal.

2. The laser driver circuit of claim 1, wherein the input signal comprises a bi-level signal.

3. The laser driver circuit of claim 1, wherein the input stage generates a differential signal on first and second terminals coupled to the limiting amplifier, and wherein the duty cycle control circuit comprises a current steering circuit to apply an offset current to at least one of the first and second terminals in response to the approximation of the average power of the pulse data output signal.

4. The laser driver circuit of claim 1, wherein the duty cycle control circuit further comprises a potentiometer settable to adjust the duty cycle of the pulse data output signal.

5. The laser driver circuit of claim 4, wherein the duty cycle control circuit further comprises a differential amplifier to generate a differential voltage on first and second terminals in response to the pulse data output signal, and wherein the potentiometer is coupled to the differential amplifier to determine a resistance between a voltage source and at least one of the first and second terminals to affect the differential voltage.

6. The laser driver circuit of claim 5, wherein the potentiometer is settable to allocate a resistance coupled between the voltage source and each of the first and second terminals.

7. A method comprising:

generating a pulse data output signal in response to an input signal, the pulse data output signal comprising a duty cycle; and

controlling the duty cycle of the pulse data output signal based, at least in part, upon an approximation of the average power of the pulse data output signal,

wherein the approximation of the average power is generated using an average power approximation circuit.

8. The method of claim 7, wherein the method further comprises:

generating a differential signal on first and second terminals in response to the input

signal; and

applying an offset current to at least one of the first and second terminals in response to the approximation of the average power of the pulse data output signal.

9. The method of claim 7, wherein the method further comprises setting a potentiometer to adjust the duty cycle of the pulse data output signal.

10. The method of claim 9, wherein the method further comprises:

generating a differential voltage on first and second terminals in response to the pulse data output signal; and

setting the potentiometer to determine a resistance between a voltage source and at least one of the first and second terminals to affect the differential voltage.

11. The method of claim 10, wherein the method further comprises setting the potentiometer to allocate a resistance coupled between the voltage source and each of the first and second terminals.

12. A system comprising:

a serializer to provide a serial data signal in response to a parallel data signal;

a laser device adapted to be coupled to an optical transmission medium to transmit an optical signal in the optical transmission medium in response to a current signal; and

a laser driver circuit comprising:

an input stage to receive an input signal;

a limiting amplifier to generate a pulse data output signal in response to the input signal, the pulse data output signal comprising a duty cycle;

an output stage to modulate the current signal based upon the pulse data output signal; and

a duty cycle adjustment circuit, including an average power approximation circuit, to adjust the duty cycle of the pulse data output signal based, at least in part, on an approximation of an average power of the pulse data output signal.

13. The system of claim 12, the system further comprising a SONET framer to provide the parallel data signal.

14. The system of claim 13, wherein the system further comprises a switch fabric coupled to the SONET framer.

15. The system of claim 13, the system further comprising an Ethernet MAC to provide the parallel data signal at a media independent interface.

16. The system of claim 15, wherein the system further comprises a multiplexed data bus coupled to the Ethernet MAC.

17. The system of claim 15, wherein the system further comprises a switch fabric coupled to

the Ethernet MAC.

18. The laser driver circuit of claim 3, wherein the average power approximation circuit is configured to maintain a voltage at an input terminal of the current steering circuit, the voltage representing the approximation of the average power of the pulse data output signal.

APPENDIX II - EVIDENCE

None.

APPENDIX III - RELATED PROCEEDINGS

None.